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The Center of Gravity Debate Resolved

A Monograph
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ABSTRACT

The Center of Gravity Debate Resolved, by Lieutenant Colonel Dale C. Eikmeier, USA, 40 pages.

This paper examines the question whether systems theory, and the concepts of systems-shock and the center of gravity are compatible and have any utility in military planning. Currently there is a debate between systems theory proponents who argue that Clausewitz's center of gravity is obsolete and no longer has any utility in modern warfare. Others argue that not only is the concept of center of gravity still valid, it is the essence of military planning that focuses military effort. The evidence clearly shows that if the current systems-based concept of center of gravity, as defined in joint doctrine, is used, the concepts are compatible. However, if the definition is the traditional Clausewitzian concept, they are not compatible. The historical examples of the Battle of France, Operation Just Cause, and Operation Desert Storm demonstrate this.

Systems theory, systems-shock and the center of gravity are not only compatible; they need each other to be of utility. Planners need systems theory, to explain the complex and adaptive nature of modern societies and militaries. They need it to correctly identify and describe centers of gravity and decisive points. Without systems theory, planners would resort to the obsolete, Clausewitzian concept of the center of gravity and attempt to identify the greatest concentration of combat power as the center of gravity. If this concentration existed it would lead to clashes of strength and costly attrition warfare that otherwise might be avoided.

Clausewitzian concentrations of power however, rarely exist. Generally modern militaries and societies do not create such obvious targets. They disperse power across various systems and link or network them so they can concentrate power when needed and then rapidly disperse it for survivability. Systems theory explains this linking and networking process and how these linkages and enabling systems can become centers of gravity or decisive points. Therefore without systems theory, planners will look for Clausewitzian centers of gravity that may not exist.

The systems-based concept of center of gravity and decisive points are essential tools of campaign design. The systems-based concept of center of gravity maintains its ability to focus military effort on identifiable systems or capabilities and to neutralize those systems or capabilities, thus removing the enemy's means of resistance. Like a magnifying glass, the center of gravity concept focuses military energy into an intense effort directed at the enemy's centers of gravity or decisive points and prevents dispersion and wasted effort. Thus the center of gravity remains a valid and powerful tool for military planning.

Systems theory and systems-shock also need the concept of center of gravity. Without the center of gravity, systems theory would be a descriptive theory with no practical utility. The center of gravity concept gives systems theory a practical military application. The center of gravity and decisive points provide a means to focus systems-shock. Without the center of gravity concept to focus systems-shock, military resources could be wasted in futile efforts.

Because the historic examples show that there is compatibility between the modern systems-based concept of center of gravity, systems theory, and systems-shock, the debate should end.

CONTENTS

SECTION ONE: INTRODUCTION

THE PROBLEM

> "Hence studying the classics will be of value if we focus our attention not only on the principles that are completely relevant but also on the principles that do not totally satisfy us, which have either become completely obsolete or should be subjected to extensive modification."
> A.A. Svechin[1]

The classic Clausewitzian concept of the center of gravity does not totally satisfy many modern military theorists. The evidence of this dissatisfaction is a continuing debate between systems theorists and adherents to Clausewitz's concept of the center of gravity.[2] But is the center of gravity completely obsolete or is it merely in need of extensive modification? One side argues that the center of gravity is a valuable concept that enables the military planner to focus military effort in an efficient and effective manner. William Mendel, a former professor at the U.S. Army War College, supports this view. He argues that the key concepts of campaign design are: "the notions of center of gravity, lines of operation and culminating points."[3] He claims, "The essence of operational art is the concentrating, in some way, military resources against the enemy's main source of strength; his center of gravity."[4] The other side argues that the center of gravity is outdated theoretical dogma from a pre-industrial era that does not reflect the complex systemic reality of modern warfare. In an article on centers of gravity, Colonel Mark Cancian, states.

> "These concepts (center of gravity) may be good in theory, but they rarely exist in the real world in a way useful for military planners. The problem is not, as some authors suggest, that centers of gravity are hard to identify and therefore underused by planners; the problem is that the centers of gravity and critical vulnerabilities just are not there."[5]

In this debate each side has a main point. Simply stated, center of gravity adherents

believe the center of gravity to be a powerful and useful tool for war planners to focus military effort. They claim that without a center of gravity to focus military effort, energy would be dissipated across a broad expanse of enemy targets and capabilities producing limited and indecisive results. There is strength behind this argument. However, the anti-center of gravity school argues that modern warfare is best explained and understood by systems and complexity theory. They claim that the pre-industrial age concept of center of gravity is too simplistic and blinds planners to the complex and adaptive nature of modern military systems. This is also a strong argument. So who is right, and is this question even important?

The question is important because, even though U.S. Joint doctrine has embraced the concept of the center of gravity, the debate continues. How can the military community continue to use the concept as the cornerstone of campaign planning when it is so widely criticized and misunderstood within the same community? The military needs to end this debate and come to a consensus on the validity of the center of gravity as a planning tool. Until this debate is resolved, the concept of center of gravity will be an albatross around the neck of sound military campaign planning.

THE SOLUTION

The reason this debate continues to exist is because elements within the military intellectual community view the center of gravity and systems theory as incompatible. This is simply not true. This paper shows that the modern definition of center of gravity is compatible with systems theory. It will also show that the cause of the debate is an incorrect understanding, and an obsolete definition of the center of gravity that comes from the way military graduate schools teach the concept.

Systems proponents argue against the Clausewitzian definition and its use as a planning tool, not against the current non-Clausewitizian center of gravity definition in joint doctrine. Unfortunately, some proponents of the center of gravity as a planning tool still cling to an obsolete Clausewitzian meaning and not the current definition. Thus, Clausewitz's definition becomes the cause of debate. Because each side in the debate is arguing past the other and not against the other, it may be possible to bring them both together. To accomplish this, military graduate schools need to construct a new mental framework for teaching the center of gravity concept. First, military graduate schools need to stop teaching the outdated linear-based Clausewitzian concept of the center of gravity as the essence of campaign design. They then need to replace it with a systems-based concept of center of gravity. This way the schools will provide military planners with a useful tool based in modern theories with greater utility in modern warfare. If military graduate schools teach systems theory, and its sub-set, systems-shock, with the systems-based concept of center of gravity, the debate will end. More importantly the schools will provide planners with a powerful trinity: systems theory, systems-shock and the center of gravity, that together form the true "essence of campaign design." Only then will the current joint doctrine of center of gravity enjoy broad intellectual support.

Can this be done? Can theorists and history reconcile the concept of a center of gravity with the ideas in systems theory? Are they in fact compatible? This study shows that the answer is yes. The historical examples of the 1940 Battle of France, Operations Just Cause and Desert Storm show that center of gravity and systems theory are in fact compatible. They also show that when the two concepts are combined with the concept of systems-shock, they form a powerful trinity. Since the evidence shows they are compatible, the graduate-level military schools need to teach these concepts and theories in an integrated systems-based model. The

concept of center of gravity must be taught in the context of systems theory, and not in its historical Clausewitzian context. Even the current definition of center of gravity in joint doctrine has moved from Clausewitz to a systems-based definition.

Before the paper argues the compatibility of center of gravity and systems theory, it must define system theory, systems-shock and the historical and current joint doctrinal definitions of center of gravity.

SECTION TWO: DEFINITIONS

SYSTEMS THEORY, SYSTEMS-SHOCK AND THE CENTER OF GRAVITY

SYSTEMS THEORY AND SYSTEMS-SHOCK

Peter M. Senge explains systems theory, as a way of viewing and explaining events from a holistic approach rather than a reductionist approach. He states in his book, The Fifth Discipline:

> Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static "snapshots." It is a set of general principles-distilled over the course of the twentieth century, spanning fields as diverse as the physical and social sciences, engineering, and management.... Systems thinking is a discipline for seeing the "structures" that underline complex situations, and for discerning high from low leverage change.[6]

While systems and complexity theories are not specific to military operations, there is a growing body of literature that has adapted these theories to military organizations and operations. Military theorists such as A. A. Svechin, V.K. Triandafillov, Dr. James J. Schneider, Shimon Naveh, Colonel John Warden, and Colonel David Deptula have written on military applications of the basic concepts of systems and complexity theory. Although they have different names for their concepts: Operational Shock, Udar, Cybershock and Parallel Warfare,

they all share a central concept. That concept is that the rival organization should be viewed holistically as a complex system, and if the system's structure and interconnecting network can be attacked and degraded the system can be paralyzed and defeated. This attack uses the principles of mass, momentum, speed, simultaneity, fragmentation, depth and synchronization to paralyze and disintegrate the rival system.[7] Systems-shock is the term this paper uses for this concept.

A complete discussion of each of these theorists' ideas is beyond the scope of this paper. However, since elements of their concepts are germane to understanding the systems theory, systems-shock and center of gravity debate, portions are included. The following illustrate the idea of systems-shock. Dr. Schneider in "Cybershock" says:

> Cybershock is a pattern of warfare that causes paralysis by attacking the enemy's nervous system in the same way that maneuver causes exhaustion by defeating the opponents metabolic system: his logistics.[8]

Simon Naveh writes:

> The basic proposition is that the way to defeat a modern military system is not by aiming at its destruction, as was claimed by Clausewitzian philosophy for more than a hundred and twenty years, but rather through the notion of operational shock, defined in Russian as Udar. Moreover, these theoreticians {Soviet theorists of the 1920-1930s} learned that the effectuation of operational shock implied, first and foremost, the neutralization of the rival system's rationale, i.e. its operational ability to attain the aim or objectives assigned to it by the strategic authority.[9]

Colonel David Deptula's contribution to systems-shock is "Parallel Warfare." He writes:

> Parallel warfare is the simultaneous application of force in time, space, and each level of war, against key systems to effect paralysis on the subject organization's ability to function as it desires. The object of parallel warfare is effective control of the opponent's strategic activity.[10]

Colonel John Warden III argues against a Clausewitzian view and for the systems approach in his article, "The Enemy as a System."

> As strategists and operational artists, we must rid our selves of the idea that the central feature of war is the clash of military forces. In strategic war, a clash may take place, but it is not always necessary, should normally be avoided, and is almost always a means to an end and not an end in itself.
>
> If we are going to think strategically, we must think of the enemy as a system composed of numerous subsystems. Thinking of the enemy in terms of a system gives us a much better chance of forcing or inducing him to make our objectives his objectives and doing so with minimum effort and the maximum chance of success.[11]

What these systems-shock proponents share is the idea that Clausewitz's nineteenth century model of warfare is no longer applicable to modern warfare. They believe that Clausewitz's model where a decisive battle, such as Jena-Austerlitz, could destroy unitary armies and result in a forced settlement on the rival political entity, no longer reflects reality. They believe that modern militaries are part of larger political, economic, technological, and societal systems that are highly complex. They believe that Clausewitz's center of gravity is too simple a model that fails to account for the development of complex, distributive, adaptive and redundant systems and is therefore obsolete. Systems-shock proponents argue that societies and militaries are thinking, adaptive systems that, for survivability reasons, do not concentrate key capabilities in Clausewitzian centers of gravity. Rather, they spread them out and protect them through complex systems. These systems are networks that are protected by duplication, redundancy, distribution and connectivity. Hence, a center of gravity in the Clausewitzian sense does not exist.

They also argue that because of the size and durability of modern militaries they can not be destroyed except at high cost and through protracted and exhaustive operations. Therefore, a more efficient method to achieve war aims is not through destruction of the rival military, but through destruction of the rival system's ability to function. Systems-shock theorists claim that by understanding the enemy's system and identifying and attacking the system's critical

capabilities, requirements, and linkages, (points of high leverage change) that the system can be neutralized or destroyed.

Does systems-shock rule out the idea of center of gravity or only Clausewitz's definition of a center of gravity? This question is the heart of the debate, but it also implies that there is more than one meaning to center of gravity.

CENTER OF GRAVITY

What the center of gravity means today and what it meant when Clausewitz first wrote about it one hundred and fifty years ago are significantly different. However, the differences do not cause the problem. It is when people fail to realize there is a difference and seek understanding and clarification of the modern meaning of center of gravity in Clausewitz's writings that results in confusion.

Carl von Clausewitz is the center of confusion. The meaning of center of gravity depends on where in Clausewitz's On War you find it. In Chapter 27 of Book Six he introduces the concept of center of gravity. In the following quote, Clausewitz identifies the concept of center of gravity with the greatest concentration of military forces. (See Appendix Figure One)

> A center of gravity is always found where the mass is concentrated most densely. It presents the most effective target for a blow; furthermore the heaviest blow is that struck by the center of gravity. The same holds true in war. The fighting forces of each belligerent-whether a single state or an alliance of states-have a certain unity and therefore some cohesion. Where there is cohesion, the analogy of the center of gravity can be applied. Thus these forces will possess certain centers of gravity, which by their movement and direction, govern the rest; and those centers of gravity will be found wherever the forces are most concentrated.[12]

In Chapter 28 of Book Six Clausewitz expands on the idea of concentration of force. He claims that the focus of effort should be directed by the friendly center of gravity against the

opposing center of gravity and any effort to divert this focus is counterproductive.

> A major battle in a theater of operations is a collision between two centers of gravity; the more forces we can concentrate on our center of gravity, the more certain and massive the effect will be. Consequently, any partial use of force not directed toward an objective that either cannot be attained by the victory itself or that does not bring about the victory should be condemned.[13]

What Clausewitz is saying in Book Six is that militaries or armies create centers of gravity by concentrating their power and that this center of gravity is best used against the opposing center of gravity. The centers of gravity then attack the other and attempt to make it incapable of further resistance.[14] This has lead to a linear direct force-on-force view of Clausewitz's concept of center of gravity. This interpretation is widely held today and explains why many planners insist that the center of gravity is always some military capability. While this is a common interpretation it is not the only interpretation offered by Clausewitz.

In Book Eight Clausewitz uses the term, center of gravity, in an entirely new context. Clausewitz, perhaps using prototype systems thinking, admits to the possibility that centers of gravity other than the army could exist and should be identified.

> What the theorist has to say here is this: one must keep the dominant characteristics of both belligerents in mind. Out of the characteristics a certain center of gravity develops, the hub of all power and movement, on which everything depends. That is the point against which all our energies should be directed.[15]

Clausewitz goes on to cite examples of things that could constitute centers of gravity.

> In countries subject to domestic strife, the center of gravity is generally the capital. In small countries that rely on larger ones, it is usually the army of their protector. Among alliances, it lies in the community of interests, and in popular uprising it is the personalities of the leaders and public opinion. It is against these that our energies should be directed. If the enemy is thrown off balance, he must not be given time to recover. Blow after blow must be aimed in the same direction: the victor, in other words, must strike with all his strength and not just against a fraction of the enemy's. Not by taking things the easy way... but by

> constantly seeking out the center of gravity of his power. By doing all to win all, will one really defeat the enemy.[16]

Having acknowledged that the enemy's source of power could be something other than the military Clausewitz claims that it is still wise to focus on the enemy's military.

> Still, no matter what the central feature of the enemy's power may be – the point on which your efforts must converge – the defeat and destruction of his fighting forces remains the best way to begin, and in every case will be a very significant feature of the campaign.[17]

In summary, Book Eight says that centers of gravity, other than the military, exist and they are "the point on which your efforts must converge." However, the best way to get at these centers of gravity is through the destruction of the enemy's military. The way to achieve this destruction is by concentrating your force's center of gravity and throwing it against the enemy force's center of gravity.

Clausewitz's force-on-force orientation is the core complaint of modern systems theorists. The more military planners rely on Clausewitz's force-oriented center of gravity, the less validity the center of gravity concept has in the minds of systems theorists. This is because system theorists see not only military forces but also, their linkages and inter-relationships with other systems as potential centers of gravity. However, the greater the reliance on the modern definition of center of gravity, the greater the validity in the minds of systems theorists.

The modern concept of center of gravity has its roots in Clausewitz but contains some important differences. Joint and U.S. Army doctrinal definitions have made subtle changes to Clausewitz's concept over the years. Unfortunately some of these differences may be too subtle and only contribute to the confusion. The U.S. Marine Corps, taking a more radical step, kept only the term center of gravity and significantly changed its meaning from the original "source of strength, hub of power" to a vulnerability. Either way, understanding all of these differences

is essential to resolving the debate and improving military curriculum.

In recent years the U.S. military has modified the meaning of center of gravity in order to make it more relevant to modern warfare. In 1993 the U.S. Army's definition of center of gravity contained the Clausewitzian quote, "The center of gravity is the hub of all power and movement upon which everything depends."[18] In 1998 the Army deleted the "hub of all power" from its draft manual FM 100-5. The "hub of all power" is a powerful analogy and a useful heuristic for understanding Clausewitz's concept, but it implies singularity, and simplicity that is not present in modern warfare. This change opens the concept to a systems approach.

Another important change is the pluralism in the modern definition. The current joint definition defines center of gravity as: "Those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength, or will to fight."[19] This acknowledges that there can be several centers of gravity, both internal and external to military forces, that in a synergistic way provide military forces their strength and will to fight. The idea that there can be multiple centers of gravity brings the concept more in line with systems thinking.

These new centers of gravity can include other systems, system linkages, and enablers. The way to affect centers of gravity is through direct attack or indirectly through decisive points. Decisive points according to FM 100-5 Operations, "...are not centers of gravity; they are keys to getting at centers of gravity."[20] The seizure, destruction, or damage, to a decisive point adversely affects the center of gravity to the point of unbalancing it. What defines a decisive point then is its effect on a center of gravity. For clarification a decisive point at one level of war could be a center of gravity at another. For example, a system that affects a strategic center of gravity is a decisive point at the strategic level, but may be a center of gravity at the operational

level. Senge called these decisive points, "high leverages of change."[21] (See Appendix Figure Two)

When attempting to identify centers of gravity, using the modern definition, the military planner is forced to view the enemy in a holistic systems approach, and understand how enemy systems relate to each other. Systems theory explains how power and capabilities can be dispersed yet able to concentrate effects in space or time through systems linkages or networks. Using systems thinking is the only way the planner can see these linkages and networks and discern high leverages of change (centers of gravity or decisive points) from low leverages of change.

The objective in campaign design is then to find and attack these centers of gravity through decisive points using the principles of systems-shock and then defeat the rival system. (See Appendix Figure Three) Thus, we have compatibility between center of gravity and systems theory. It is only when the planner strays from the modern definition and uses the traditional Clausewitzian definition does he revert to a search for a concentration of power center of gravity that may not exist. However, systems theory can explain where the elusive center of gravity is and how it works. Therefore, the further one gets from the nineteenth century definition of center of gravity and the closer to the modern definition, the more compatible systems theory, systems-shock and the center of gravity become.

To end this pointless debate, military graduate schools must teach the current joint definition of center of gravity in the context of systems theory. The best way to do this is to change the name of the concept from, center of gravity, to something like *"essential systems."* This would end the confusion and the debate by updating the concept with modern systems theory. Schools need to teach students and planners how to analyze and understand complex

systems, using systems theory in order to find areas of high leverage change (centers of gravity or decisive points). Then teach planners to attack these centers of gravity and decisive points using systems-shock. Only then will the concept of center of gravity (*essential systems)* be truly a powerful concept and the "essence of operational art."

SECTION THREE: THE EVIDENCE

Historical examples show that the concepts of systems theory, systems-shock and center of gravity are in fact compatible. The Battle of France, in 1940 is an example of a center of gravity (German Army Group A) using systems-shock against a decisive point in order to cause the collapse of the Allied center of gravity (First Army Group). Operation Just Cause is an example of a center of gravity that was identified by using systems theory. It is also an example of the use of systems-shock directly against a rival center of gravity and a decisive point causing the system's disintegration. Lastly, Desert Storm is an example of the failure to use systems theory to identify centers of gravity and decisive points and the unfocused use of systems-shock, which resulted in what U.S. News and World Report, called a "triumph without victory."[22] These examples prove that the concepts are not incompatible; rather they are partners, a trinity, that together form the essence of operational art.

THE BATTLE OF FRANCE

Although the Battle of France predates the modern center of gravity and systems theory, the systems-shock and center of gravity model it presents, offers a sound theoretical explanation for the German's success. The Germans focused on the Allied center of gravity, the First Army Group. However, they did not attack it directly with their center of gravity. Rather, they used

their center of gravity at the strategic level to sever the First Army Group's system linkages and induce systems-shock. (See Appendix Figure Four) They also used systems-shock (blitzkrieg) at the operational and tactical levels to achieve a penetration that enabled the strategic-level maneuver that completed the systems-shock paralysis of the Allies' armies and command and control.

The initial German plans for the invasion of France called for the main attack through Holland and Belgium. These plans would produce a classic Clausewitzian force-on-force, center of gravity versus center of gravity, fight in Holland and Belgium. This is exactly what the Allies expected and they based their plan (Plan D) on a rapid movement of their main forces to defensive positions along Belgium's Dyle River. Unfortunately for the Allies, the Germans viewed this traditional approach as an attrition-oriented plan unlikely to achieve success and therefore dropped it.[23]

The new strategic plan, created by Erich von Manstein, shifted the German concentration (center of gravity) from Army Group B in the north to Army Group A in the center. Manstein moved the German center of gravity away from the Allies' center of gravity, (First Army Group) to a lightly held sector between Namur and Sedan.[24] The German Army, rather than throwing its center of gravity at the Allies' center of gravity and hoping to physically throw it off balance, positioned their center of gravity to outflank and penetrate to the rear of the Allied First Army Group. Hence, by rapid and deep maneuver, the German's goal was to produce shock and paralysis of Allied forces.

The center of gravity at the operational level was Panzer Gruppe Kleist, consisting of two Panzer Corps and a Motorized Corps. At the tactical level Heinz Guderian's XIX Panzer Corps was the center of gravity. Together they induced systems-shock by using the principles of mass,

momentum, synchronization, and depth. For example, at Sedan Guderian massed three panzer divisions, a reinforced infantry regiment, supporting artillery, and almost 1500 attack aircraft on a six-kilometer front.[25] This force slammed into one French division and destroyed it in three hours. Guderian and the rest of Panzer Gruppe Kleist then poured through a fifty-kilometer gap near Sedan breaking the French line. Less than forty-eight hours after the start of Panzer Gruppe Kleist's attack France's Prime Minister, Reynaud called Winston Churchill and told him, "We have been defeated."[26]

The German success owes as much to luck as to planning. Guderian's rapid advance was the result of his initiative and disobedience of orders to halt.[27] France's rapid capitulation, although brought on by the blitzkrieg, was sealed by the fact that France had no strategic reserve, an uncommitted center of gravity, to form a counter attack force.[28] However, these factors do not obscure what the Germans accomplished in May and June 1940. In a period of six weeks the Germans accomplished what four years of fighting in the First World War could not. What was different?

Two elements made the Battle of France different from World War One. The avoidance of a Clausewitzian center of gravity versus center of gravity strategy in favor of a center of gravity attacking a decisive point, a point of high leverage. Secondly the speed and momentum of the German attack paralyzed Allied command and control and left the Allied armies unable to react.

The Germans avoided World War One style high-attrition oriented battle by using strength against a decisive point rather than strength against strength. The concentration of forces that created a center of gravity in Panzer Gruppe Kleist was thrown at Sedan, a decisive point, rather than at the Allies' center of gravity. Sedan was a decisive point, not because of

terrain or its relative weakness, but because a penetration there threatened the First Army Group's flank and rear security. According to Dr. Schneider, "To be decisive, successful attack against the point in question must have some adverse impact on the enemy's center of gravity - his main forces."[29] The rapid penetration at Sedan and the subsequent drive to the west cut off the First Army Group from its rear and supporting Allied armies, (system linkages) removed its freedom of action and destroyed its morale (system enablers). Thus, through an attack on a decisive point a center of gravity was toppled.

The other contributing factor to the German victory was the paralysis of the Allies' command and control systems. The Allies fully expected the main German invasion to bypass the defenses of the Maginot Line and the Ardennes Forest and attack through Holland and Belgium. To counter this the Allies created Plan D, which had the First Army Group swing from the northern French border to defensive positions in Belgium. The pivot of this swinging movement was at Sedan. When the Germans attacked Holland and Belgium on 10 May 1940, the First Army Group moved in accordance with Plan D. From the Allies' perspective the attack through Holland and Belgium was expected and everything was going according to the plan. However, the attack and penetration at Sedan on the 13th, not only shocked the Allied leaders, it froze their decision making ability. The Allies did not expect an attack of such strength and considered it impossible. Therefore they had no contingency plan to respond to it. This paralyzed decision-making for three critical days. It was not until the 16th that the British Expeditionary Force was informed of a change to Plan D and to pull back to the Schelde. On the 18th French General Gamelin, Supreme Commander of the Armies, issued orders for the First Army Group to fall back to the Somme in France, but it was already too late. The Germans arrived first and the First Army Group was surrounded.[30]

It was systems-shock; the mass, momentum, and depth of the main German effort from an unexpected direction that broke systemic linkages and produced paralysis in the Allies. The rapid movement of German forces from Sedan to Abbeville physically broke the linkages between the First Army Group and the other military centers of gravity. The attack also produced a psychological shock that broke the linkage between the political/military command and control system and the First Army Group. Thus systems-shock is always a shock to the command and control systems. The will and morale systems also disintegrated long enough for the Germans to achieve their aims. Thus, the Germans attacked and shocked what Dr. Schneider calls the three domains of battle: the physical, cybernetic, and moral, producing systemic shock effects[31]. Many will argue whether this systems-shock was by German design or fortunate coincidence.[32] It does not matter. Either way, the use of systems-shock by a center of gravity against a decisive point to break a rival center of gravity's system linkages explains the German success in the Battle of France. It clearly shows that systems theory, systems-shock and the center of gravity are compatible and fundamentally related.

OPERATION JUST CAUSE

Operation Just Cause is a clear example of the compatibility of systems theory, systems-shock and the modern center of gravity concept. At first glance, Operation Just Cause is an example of a center of gravity being directed against a center of gravity in an almost Clausewitzian sense. However, deeper study reveals it as demonstration of the use of systems theory to identify centers of gravity and decisive points. Once identified, military planners employed the principles of systems-shock to paralyze and overwhelm the enemy's center of gravity.

A non-systems approach to the U.S.' problem with Panama in 1989 might lead to the conclusion that Manuel Noriega was the genesis of the problem, and the center of gravity, and his removal would be the solution. There is strong linear logic in this reasoning. Remove the cause of the problem, or the center of gravity, and the problem should go away. However, systems and complexity theory would suggest that Manuel Noriega was not the cause of the problem, but only its current manifestation. Systems and complexity theories suggest that the situation Panama in the 1980s was the product of multiple complex and dynamic systems and that Manuel Noriega was only a part of a network of systems. Hence, his removal might not solve the real problem.

It would take a systems approach, a holistic look at Panama in the 1980s to determine who or what the problem really was. Only by using systems theory could the political and military decision makers identify the working systems, their linkages, and what Senge calls the "areas of high leverage change," [33] and what the military would call decisive points. The holistic systems approach to the problem is what the U.S. military chose.

Planners focused their systems approach on the Noriega – Panama Defense Force (PDF) relationship. (The Guardia Nacional was renamed the Panama Defense Force in 1983.) The Noriega – PDF relationship was symbiotic and illustrates the linkages between multiple centers of gravity in complex dynamic systems. Noriega provided the PDF with leadership, and strong motivation. His anti-U.S. policies and willingness to stand up to the "yanquis" instilled an element of pride in the PDF and loyalty to him. His economic and military connections with Cuba, Nicaragua, Libya and drug traffickers provided wealth and power to loyal PDF followers.[34] He gave the PDF a purpose, a rationale for being.

The other half of the relationship, the PDF, provided Noriega his power base. The PDF

was Noriega's means to exert direct physical control over Panama. Without the PDF Noriega had no power or influence.

The symbiotic relationship between these two systems provided the key to solving the Panama problem. (See Appendix Figure Five) A single focus on the capture and removal of Noriega was problematic and high risk. However, should it succeed the PDF would simply replace Noriega with the next dictator in waiting and return to the status quo. The PDF is an example of what Dr. James Schneider calls a "self-organizing system."

> An army, on the other hand, may suffer complete cybernetic collapse – the analogue to a "broken neck" – but spontaneously reorganize at lower echelons of command and continue on with its mission."[35]

What was needed was a strategy that separated Noriega from his power base and prevented the PDF from reorganizing.

The systems approach lead military planners identify the PDF as the critical center of gravity. They concluded that Noriega, although a target and obviously a source of motivation, was not the critical center of gravity, but a decisive point that affected the critical center of gravity, the PDF. Any operation that focused on Noriega might be successful in arresting and bringing him to the Unites States for trial on drug trafficking charges but, it would do little to solve a deeper problem in Panama. The problem in Panama was the institutionalization of corruption and anti-democratic, anti-U.S. policies. The PDF was the current manifestation of this institutionalization. The PDF was the only real power in Panama. It directly controlled the military, police, and most of the government.[36] Through intimidation it controlled political, economic, judicial and criminal activity in Panama.

Manuel Noriega did not create the PDF or its predecessor the Guardia Nacional. He was a product of it.[37] The Guardia Nacional and the PDF, were training schools for corrupt military

strong men and dictators. While Noriega's capture would meet a U.S. objective, it would not solve the problem. There were others like Major Moises Giroldi, waiting to replace Noriega should the U.S. remove him. Only the overthrow of the PDF as an institution would break dictator cycle. Thus the PDF, not Manuel Noriega was the main center of gravity. JCS Chairman General Colin Powell made this point to the National Command Authority when he said:

> Even if U.S. intelligence could locate Noriega, an operation to snatch him would not solve the problems with Panama. The entire PDF leadership was corrupt, and there were Noriega clones who would replace him. The entire PDF must be dismantled.[38]

Thus a systems theory approach identified the PDF as the main strategic and operational center of gravity in Panama. It also identified Noriega as a decisive point that provided purpose, direction and motivation to the center of gravity.

Operational and tactical level planners at the XVII Airborne Corps, Lieutenant Colonel Tim McMahon, and Major David Huntoon, also used the systems approach in analyzing the problem. Huntoon explained:

> We were very concerned about the political aspects, and the business of keeping the commander focused on victory. So we looked at it as a campaign with a series of objectives, and not as one set-piece battle. So we looked beyond the first D-day strikes and thought about all the things we would have to accomplish in the next several days. It was clearly something that was going to be happening on several levels, not just the military level."[39]

The planners at XVIII Airborne Corps realized that they could not solely focus on military issues. They worked in an environment where the U.S. and Panamanian political, military, social and humanitarian systems interconnected. Knowing which system to work in and what linkages or centers of gravity to focus on was critical to mission success. It was an environment where modern systems theorists had more relevancy than nineteenth century military theorists.

Once the military planners identified the PDF as the main center of gravity their focus became to how to eliminate it so it could not reorganize and rise as a future threat. Three factors shaped the methodology of the plan. First, the United States had overwhelming military power at its disposal with few if any logistical constraints including time. Secondly, Panama was a friendly country with whom the U.S. wanted to continue good relations. Lastly, the U.S. military had a responsibility to protect thousands of U.S. citizens in Panama. These three factors coincided to push the Army to a systems-shock strategy. Systems-shock offered the best hope of a quick campaign. Although the U.S. could pound the PDF into dust, the U.S. did not want to lay waste Panama in the process or risk the reprisals and hostage taking of U.S. citizens. Policy makers and planners also feared the possibility of prolonged guerrilla warfare. Therefore they wanted to remove not only the capability of resistance but the motivation as well. The United States wanted to remove a cancer surgically, not destroy the patient. This led to the idea of systems-shock to remove the leadership, cut command and control, and breaks the cohesion of the PDF through fragmentation.

General Powell placed an emphasis on using forces large enough to overwhelm the PDF and to do it in the shortest possible time.[40] This guidance incorporated the systems-shock principles of mass and speed. However, it was in the mission analysis that planners recognized the utility of the principles of depth and simultaneity. General Stiner, XVIII Airborne Corps Commander said:

> There were certain key things that we had to do. We knew we had to knock out the [PDF central headquarters in Panama City, La] Comandincia, to neutralize the command and control. We knew we had to take down the police and most of the institutions of government because they, too, were run by the PDF. We knew that we had to take on those PDF units that could influence this action. If we did that – and we did it all simultaneously to completely paralyze them and neutralize them – anything left would be sitting out there with no guidance, no connectivity, no instruction. We could then go after them separately.[41]

General Stiner's plan called for severing of the linkages that made the PDF a coherent functioning system. By using the principles of mass, simultaneity and depth through out the country, the PDF's linkages were to be cut leaving PDF units isolated and with no purpose, no motivation and no option but to surrender or be defeated. (See Appendix Figure Six)

At 0045 20 December 1989 U.S. military forces commenced Operation Just Cause and attacked the PDF. Originally scheduled to start at 0100, General Stiner ordered special operations to launch their attacks fifteen minutes early due to a loss of some tactical surprise.[42] Special operations forces conducted simultaneous assaults at the Carcel Modelo prison, the Comandancia, the Punta Paitilla Airport, the Pecora River Bridge, and several suspected Noriega hideouts.

Conventional forces started their assaults at H-hour, 0100 20 December as scheduled. The following is a break down of unit missions that illustrate the mass and simultaneity of the initial assault:

Task Force Atlantic (one infantry battalion, 7th Infantry Division, one infantry battalion, 82d Airborne Division)

- Secure Renacer Prison and free Panamanians jailed after the 3 October anti-Noriega coup.
- Secure Madden Dam and Cerro Tigre electrical distribution facility.
- Neutralize the PDF 8th Infantry Company and naval infantry company.

Task Force Semper Fi (Marine rifle company, Marine light armored infantry company, and Military Police units)

- Secure Bridge of Americas.

- Secure area around Howard air base.

Task Force Red/Pacific (three Ranger Battalions, reinforced by an airborne brigade (-) at H+45)

- Secure PDF base at Rio Hato and neutralize the PDF 6th and 7th Infantry Companies.
- Secure Torrijos-Tocumen airport and neutralize PDF 1st Infantry Company.

Task Force Bayonet (193d Infantry Brigade, one mechanized infantry battalion from the 5th Infantry Division, one tank platoon from the 82d Airborne Division, and Military Police units)

- Secure targets and facilities in and around Panama City including the Fort Amador and the Comandancia.
- Neutralize the PDF 5th Infantry Company and other PDF units.[43]

The use of overwhelming force used simultaneously had the desired effect. At 1029 Task Force Atlantic reported its missions accomplished. Task Force Semper Fi completed its D-Day missions and at 0700 moved out to a second mission. Task force Bayonet with some of the toughest missions captured and neutralized Fort Amador and the 5th Rifle Company at 1029. The Comandancia was secured by 1800 hours and effectively ended any resistance and centralized command and control of the PDF. With the neutralization of the 1st PDF Rifle Company at Tinajitas at 1433, Task Force Red/Pacific completed its D-Day missions. By the end of D-Day Noriega's control of the PDF was severed and he was on the run. The PDF's leader, rather than rallying his forces for a guerrilla war, went into hiding. The PDF as a coherent organization no longer existed; its cohesion was shattered and its members were either casualties, captured, dispersed, or awaiting U.S. forces to accept their surrender. More

importantly, the PDF lost its purpose for existing. On Christmas day in the remote province of Chiriqui the last PDF unit surrendered without resistance.

Operation Just Cause showed the validity of systems theory, systems-shock and a systems based concept of center of gravity as military planning tools.

In Operation Just Cause systems theory provided the theoretical model for explaining the strategic and operational environments. Systems theory explained the relationships between the PDF, a history of military dictators, and the current leader, Manuel Noriega. It also provided the key to solving the short-term problem with Noriega and the long-term problem with the PDF. That key was the separation of Noriega from his institutional power base and then the destruction of that institution so it could not replace him. Without a systems approach the U.S. might have achieved its goal of arresting Noriega, but it is doubtful that it would have achieved the long-term goal of restoring democracy to Panama

Operation Just Cause validated the concept of systems-shock and its principles of mass, momentum, simultaneity, fragmentation and depth. Approximately 20,000 U.S. troops faced 12,800 members of the PDF.[44] The U.S. suffered twenty-three killed and 322 wounded while Panamanian authorities reported that 51 PDF were killed.[45] The exact casualty figures for the Panamanians are, however, subject to debate. Regardless, the relatively low number of casualties on both sides, 0.1% killed for the U.S. and 0.4% for the PDF, demonstrate the utility of systems-shock. Had the planners chosen a sequential set piece, attrition-style campaign over systems-shock the casualty rates would have been higher and the duration of the campaign longer.

In addition to low casualty rates and the shortness of the operation, systems-shock may have been a factor in the prevention of protracted guerrilla warfare. The simultaneous nature of

the operation fragmented PDF command and control and left PDF units with no guidance or instructions. The PDF's leader Manuel Noriega was so concerned with his personal escape that he had no time or means to consider rallying his forces for a guerrilla fight. The paramilitary Dignity Battalions, an irregular armed force that constituted a potential guerrilla force, appeared more interested in robbing, looting, and snipping than guerrilla warfare.[46]

Just Cause also validated the modern concept of center of gravity. Planners recognized two interconnected systems, Noreiga's leadership and the PDF as coherent force. This allowed planners to focus on the relationship between these two systems rather than trying to find the single "hub of all power." The use of special operations forces to hunt for Noriega and conventional forces to neutralize the PDF produced a powerful synergism. Rather than dispersing military effort, planners directly attacked the center of gravity, (the PDF) and indirectly, through a decisive point, simultaneously shattering their connectivity and bringing them down.

The conclusion is that there is compatibility between systems theory and the modern concept of centers of gravity. Military planners wanting centers of gravity to focus campaign planning have a valid planning tool in the modern systems theory based concept of centers of gravity. Theorists arguing against Clausewitz's "hub of all power" were also vindicated by the example of Operation Just Cause. Thus we have agreement between both sides of the systems-center of gravity debate.

OPERATION DESERT STORM

The Battle of France and Operation Just Cause are examples of the compatible use of systems theory, systems-shock, and centers of gravity. The Desert Storm example argues for the

close integration of the three concepts by showing the failure in Desert Storm to use systems theory, systems-shock and centers of gravity in a synergistic way. Desert Storm is a case study of what happens when planners have different concepts. (The air and ground campaign planners did not even use the same definition of center of gravity.[47]) The case study shows what happens when planners use these concepts independently to develop separate campaign plans that fail to produce unity of effort and a synergistic effect.

The history of Desert Storm shows that neither the air campaign, based on systems theory concept, nor the ground campaign, based on centers of gravity achieved their goals. The withdrawal of Iraq from Kuwait, and the destruction of the Republican Guards. As an example of the failure to integrate systems theory, systems-shock, and center of gravity in a campaign design, Desert Storm argues not only the compatibility of these concepts but for their closer integration.

There were two distinct and separate military campaigns in Desert Storm, an air campaign, and a ground campaign. [48] Air planners designed an air campaign using a systems-based theory and developed a single dimensional (air power) strategy that they sincerely believed and forcefully argued would force Iraq from Kuwait.[49] They believed, that by attacking strategic targets such as Saddam's leadership, command and control, electrical production, transportation infrastructure and other key targets by air they could inflict so much pain that the Iraqi leadership would evacuate Kuwait without the need of a costly ground attack.[50]

Ground planners, not putting much faith in such a single dimensional air attack, proceeded with the development of a ground campaign. Using a traditional Clausewitzian "concentration of forces, and source of power" definition of center of gravity they identified the Republican Guard Forces as the operational level center of gravity.[51] They saw the Republican

Guards as the only credible threat to the Coalition's attack to liberate Kuwait and therefore saw its destruction as a means to prevent it from interfering with the attack.

The air campaign failed to drive the Iraqis from Kuwait. The ground campaign failed to destroy the Republican Guard. However, together they still liberated Kuwait. The liberation of Kuwait was not the result of any single dimensional campaign; it was the result of the combined effects of the ground, air, and maritime strategies together. Desert Storm was a clear military victory. However, had planners integrated and used systems theory, systems-shock, and center of gravity to focus a single joint campaign, rather than separate component campaigns, Desert Storm may have achieved greater unity of effort that would have resulted in a more satisfactory ending at less cost.

The U.S. Central Command did not plan on having separate campaigns, rather they were victims of circumstances. The development of a separate air campaign was the result of opportunity and desire. Iraq's invasion of Kuwait and the potential threat to Saudi Arabia provided the opportunity. The U.S. Central Command needed combat power and they needed it quick. Air power was the obvious answer. Air power could get there quickly and in mass while ground forces would take months to build sufficient forces. Air power was not only ready to defend but could go on the offensive long before ground forces even established an effective defense. Consequently air planners developed an air campaign based on the capabilities of air power alone to achieve the political objectives.

On 8 August 1990, General Norman Schwarzkopf, U.S. Central Command Commander, asked the Air Force Vice Chief of Staff, General John Loh, for help in planning air options.[52] General Loh then tasked Colonel John Warden, and his "Checkmate" planning group to develop the plan. The Checkmate group created "Instant Thunder," a plan based on Colonel Warden's

systems-based concept of "five rings."[53]

Warden uses a five-ring model to describe modern "strategic entities" such as states, business organizations or militaries.[54] According to Warden every entity has five interrelated systems or rings, that enable the entity to function. The five rings are leadership/command and control, organic essentials, infrastructure, population, and fighting mechanisms. These rings are arranged with the most critical, (leadership) in the middle to the least critical (fighting mechanisms) on the outer edge. (See Appendix Figure Seven)

Warden combines the system of rings with the concept of center of gravity. He argues that the rings, which are systems, "describe centers of gravity for a strategic entity," and are absolutely vital for the functioning of a state or organization.[55] He also claims that these centers of gravity are also rings of vulnerability. In other words the rings are centers of gravity and if they are attacked the entity's viability as a system is threatened.

Warden believes that a rival system's objectives can be frustrated by inducing change to one or more parts of the rival's system. These "parts" are Senge's "areas of high leverage change" or centers of gravity and decisive points. Another way of thinking of inducing change is as inflicting pain. If enough pain is induced into the rival's system the rival will yield to the opposing system's objectives. However, if pain is not enough to cause it to yield, the opposing system will have to make it physically impossible for the rival to resist. Warden calls this, "strategic paralysis."[56] In strategic paralysis centers of gravity or decisive points are neutralized thus removing the systems ability to resist.

The "pain" method is directed at will and morale domains which affect Warden's leadership and population rings. However, these attacks do not have to be focused directly on the leadership or population rings. Attacks on any of the rings can induce pain and therefore

affect the leadership and population rings or centers of gravity. For example, attacks on the infrastructure ring may produce commodity shortages (decisive points) and inconveniences for the population thus affecting their morale. This shows the systemic linkages between the rings and how a decisive point can affect a ring.

Strategic paralysis is used if the will and morale domains remain unaffected by pain. Strategic paralysis seeks to remove the option of resisting by removing the physical means to resist. With strategic paralysis the rival system has no choice but to yield. The opposing system induces paralysis by collapsing one or more of the rings so that the integrity of the entity's system is broken. Military action against a center of gravity or a decisive point, as the examples of Operation Just Cause and the Battle of France showed, normally induces the collapse.

Warden recommends attacking the center ring, leadership/command, so to, "induce the command structure to make concessions or make it incapable of leading" (pain).[57] However, he recognizes this is difficult and concedes that other rings may need to be attacked or even destroyed (strategic paralysis).

> When the command element cannot be threatened directly, the task becomes one of applying sufficient indirect pressure so that the command element rationally concludes that concessions are appropriate, realizes that further action is impossible, or is physically deprived of the ability to continue a particular course or to continue combat. The command element will normally reach these conclusions as a result of the degree of damage imposed on the surrounding rings. Absent a rational response by the enemy command element, it is possible to render the enemy impotent, to impose strategic paralysis by destroying one or more of the outer rings or centers of gravity.[58]

Warden's systems theory based ring model became the conceptual underpinning of the Gulf War's "Instant Thunder" air campaign.[59] Warden and others believed that air power was ideally suited for strategic attacks against the rings and that ground forces would be unnecessary. Hence the desire for a separate air campaign. Disciples of Warden's theories, such as Brigadier

General Buster Glosson and Lieutenant Colonel David Deptula turned Warden's ideas into reality in the Gulf War air campaign, "Instant Thunder." Reality, however, meant that they would have to work with land forces whether they wanted to or not. Thus the stage was set early in Desert Storm planning for a conflict between air and ground components.

Ground planners had a different conceptual basis than the air planners. Ground planners used the 1986 FM 100-5's definition of center of gravity as their conceptual base and the key to operational design. This definition was Clausewitzian-based and conflicted with the air planners' systems-based concept of the rings. Thus two components focused their efforts in different directions.

The Army defined center of gravity as:

> The center of gravity of an armed force refers to those sources of strength or balance. It is that characteristic, capability, or locality from which the force derives its freedom of action, physical strength, or will to fight. Clausewitz defined it as "the hub of all power and movement, on which everything depends." Its attack is-or should be-the focus of all operations.[60]

Although the 1986 version of FM 100-5 contained a page and a half discussion on centers of gravity that included elements of systems theory and factors other than the military, its definition focused on the military domain.[61] This military focus led planners to look at the military system, rather than the overall Iraqi system. Using this view point, planners saw the importance of the Republican Guard and its role at the operational level, but not its importance at the strategic level. They concluded correctly that the Republican Guard was the operational center of gravity, but they failed to see it as a decisive point affecting the strategic center of gravity; Saddam Hussein. Had they taken a broader systems-view they may have seen the importance of the relationship between Saddam Hussein and the Republican Guard.

Both sets of planners misjudged the value of the Republican Guard. Ground planners

acknowledged a relationship between the security of Saddam Hussein's regime and the Republican Guard. However, they did not fully appreciate it or realize its importance at the strategic level. They focused too narrowly on the operational level and the military significance of the Republican Guard. Therefore, the primary goal of the ground main effort was to prevent the Republican Guard from counter-attacking Coalition forces. Destruction was a means to achieve this, not a primary objective. Had ground planners understood systems theory better and used a systems-based definition of center of gravity rather than the Clausewitzian-based definition they may have viewed the Republican Guard differently. They may have seen its destruction as a decisive point to upset the strategic center of gravity; Saddam Hussein.

Air planners also acknowledged the relationship between Saddam Hussein and the Republican Guard, but still placed it in the five-ring model's least important ring. They did this because they believed that attacks on the fifth ring were the toughest, most costly, and least productive. After all, militaries are designed to be tough and survive attacks. Therefore, these attacks would be long and costly affairs and not worth the effort.[62] Warden's model suggested that attacks at the center would be much more effective. This made it conceptually difficult for the air planners to see the Republican Guard as worthy of its own ring, let alone a critical ring closer to the center. Thus both air and ground planners failed to see the Republican Guard as a decisive point affecting the strategic center of gravity, Saddam Hussein's leadership.

Differing conceptual basis, (Warden's five-rings and Clausewitz's center of gravity) caused air and ground planners to view the significance of the Republican Guard very differently. Ground planners made the Republican Guard the operational center of gravity and the focus of the land component's main effort. Air planners initially ignored the Republican Guard and only reluctantly added it to their target sets. The following table from the U.S. Air

Force's, Gulf War Air Power Survey, Summary Report, illustrates the lack of importance the air planners put on the Republican Guard.[63]

Table One: Selection of Targets

Target Set	Numbers of Targets 21-Aug	20-Dec
Strategic Air Defense	10	27
Chem, Nuc, Bio	8	20
Leadership	5	27
C2/Commo	19	30
Electrical Power	10	16
Oil Facilities	6	8
Railroads Bridges	3	21
Airfields	7	25
Naval Facilities	1	4
Military Support Facilities	15	46
Scud Facilities	N/A	13
Republican Guard	**N/A**	0

Initial plans did not even include the Republican Guard as a target category. However, by December 1990 the planners were under pressure and included the Republican Guard, but had not selected any targets. The air planners' control of the air campaign and not-so-hidden agenda to win the war through air power alone upset not only the Army, but the Marines and the Navy as well. Ultimately, the Marines put restrictions on the air planners' use of Marine aircraft. Despite complaints from the other services, the air planners maintained their faith in the five rings. So

strong was this faith that by the end of January only 12 percent of Army nominated targets were attacked.[64] The conflict between ground and air commanders on air target priorities eventually caused General Schwarzkopf to appoint the Deputy Commander in Chief, General Waller, an army general who advocated a shift to targets supporting the ground commanders, as arbitrator of the targeting process.[65] Director of the air campaign, Air Force General Glosson, when referring to this shift, wrote in his journal, "This is a sad day...because we've shifted our focus prematurely from what we'd been asked to accomplish, to preparations for a land campaign."[66] Glosson even considered the shift a "foolish and lightweight" abandonment of the strategic campaign.[67]

The initial omission of the Republican Guard as a target category, and the reluctance of air power leaders and planners to allocate resources to attacking the Republican Guard demonstrated strict adherence to the five-ring model. What should have been a descriptive theoretical model became a dogmatically followed prescription. The theory of the rings held promise of a quick and easy victory for air power. However, this promise blinded air power planners to reality. They failed to see the complex and dynamic nature of the Iraqi system and set out armed with the rings to win the war on their own.

General Colin Powell warned against such enthusiasm before the Senate Armed Services Committee on December 3, 1990.

> Many experts, amateurs, and others in this town, believe that this can be accomplished by such things as surgical air strikes or perhaps a sustained air strike. And there are a variety of other nice, tidy, alleged low-cost, incremental, may-work options that are floated around with greater regularity all over this town. One can hunker down, one can dig in, one can disperse to try to ride out such a single-dimension attack. Such strategies are designed to hope to win, they are not designed to win.[68]

To those who believed in the power of the rings, General Powell's remarks were

upsetting, and heretical. Powell's remarks so alarmed Lieutenant Colonel David Deptula, lead air planner, that he sent a protesting memo to the Secretary of the Air Force, Donald Rice, who shared Deptula's concern. Both felt that Powell and Schwarzkopf were trying to deny air power's opportunity to win the war alone by insisting on a joint air-ground campaign.[69]

The problem was not the rings, but its adherents. The rings are a theoretical model that if viewed as a description of a generic system can serve as a useful tool to planners. As a generic model it can serve as a template, a start point, which can be modified to fit specific systems and situations. Once modified planners can use the rings for center of gravity and decisive point analysis. Colonel Warden agrees with this.

> Every state and every military organization will have a unique set of centers of gravity or vulnerabilities. Nevertheless, our five-ring model gives us a good starting point. It tells us what detailed questions to ask, and it suggests a priority for the questions and for operations from the most vital at the middle to the least vital at the outside.[70]

To do this, planners would first determine what level of war they are concerned with and focus on systems at that level. Then they would study the entity and its unique systems and their relationships and linkages. They would then add, subtract or rearrange rings to fit the entity. The arrangement of these rings would then help identify centers of gravity and decisive points. For example, using Iraq as the entity, a modified ring system for the strategic level could be: (See Appendix Figure Eight)

Center ring. Saddam Hussein Leadership (Strategic Center of Gravity)

Second ring. Republican Guard Forces (Strategic Decisive Point, Operational Center of gravity)

Third ring. Organic Essentials

Fourth ring. Conventional Forces

Fifth ring. Infrastructure

Sixth ring. Population

The arrangement of the rings in the example is based on an evaluation of the Iraqi system and its actions. The example is meant to illustrate the need to modify Warden's Ring Model to fit a specific entity, instead of applying the model to all entities. I placed the Republican Guard in its own ring close to the center due to its unique importance in the Iraqi system and its role in regime security. The fact that Saddam Hussein ordered its withdrawal from the Kuwaiti Theater of Operations during the Gulf War and accepted a humiliating defeat, rather than risk the Republican Guard's destruction indicates the high value he placed on the Republican Guard. Saddam Hussein's apparent lack of regard for his own population, demonstrated by the Iran-Iraq War, use of chemical weapons, and disregard to his people's suffering under UN sanctions places the population in the sixth and outer ring. The arrangement of the other rings is debatable, however, the movement of population to an outer ring and the addition of the Republican Guard illustrates the idea of modifying the original five-ring model.

Warden also states that the ring model can be applied to the operational level and to entities other than states.

> Centers of gravity exist not only at the strategic level but also at the operational level and indeed, are very similar. At the operational level, the goal is still to induce the enemy operational-level commander to make concessions such as retreating, surrendering, or giving up an offense. Like the state command structure, however, the operational commander has rings of vulnerability or centers of gravity surrounding him. In fact, each major element of his command will also have similar centers of gravity.[71]

Had Gulf War planners used a common concept of systems theory, and a systems-based definition of the center of gravity they may have been able to use and modify the ring model to produce a joint campaign plan that contained unity of effort. Part of the problem was that air

planners focused on the strategic level of war while ground planners focused on the operational level. The identification of Saddam Hussein as a strategic center of gravity and the Republican Guard as a strategic decisive point would have focused both air and ground planners towards the same objective, destruction of the Republican Guards, not merely their exclusion from the Kuwaiti Theater of Operations. (See Appendix Figures Nine and Ten) Both air and ground planners should have seen the Republican Guard as a strategic level decisive point and the operational level center of gravity. Had they seen this it would have produced unity of effort, and perhaps a more decisive victory, rather than divergence and recriminations.

Both sets of planners would have benefited. Air planners would have viewed the strategic air campaign entirely differently and focused more on the Republican Guard. Ground planners would have better understood the strategic significance of the Republican Guard and devoted more effort to destroying it and preventing its escape. With both components focused on the Republican Guard, their escape due to flawed placement of the Fire Support Coordination Line (FSCL) at the end of the war may have been prevented and a better peace obtained.[72] Desert Storm is not an example of the triumph of joint warfare. Although a victory, it is an example of different components operating on differing theoretical concepts and producing different campaign plans with different objectives. Rather than a unified joint campaign plan based on commonly accepted principles, the components developed their own campaign plans. These component plans overlapped and where they share objectives they cooperated, where the conflicted they challenged each other's motives and priorities. The result was needless friction and recrimination.

Both approaches were wrong. Air planners focused on the strategic level of war and ground planners focused on the operational. The air planners had a systems-based theory, but

applied it using a flawed five-ring model that argued centers of gravity as vulnerabilities. This concept prevented them from seeing a source of strength, the Republican Guard, as a center of gravity or a decisive point. Ground planners had a Clausewitzian-based concept of center of gravity that focused them on the military sources of power at the operational and tactical levels of war, but ignored the strategic level. Almost by definition the Republican Guard was the center of gravity. However, they only saw the Republican Guard's importance at the operational level in relation to the Kuwaiti Theater of Operations, not the overall strategic environment.

These errors could have been prevented. Central Command planners and the National Command Authority should have viewed Iraq as a system and identified centers of gravity and decisive points. The Central Command's Operations Order 91-001had three centers of gravity: Iraqi National Command Authority; Iraqi's chemical, biological and nuclear capability; and the Republican Guard.[73] The designation of these three as centers of gravity was incorrect. The chemical, biological nuclear capability was not a center of gravity but rather a force protection objective. At the strategic level the Iraqi leadership was a center of gravity and the Republican Guard a decisive point. Only at the operational level was the Republican Guard a center of gravity. Thus the Central Command mixed levels of war and centers of gravity into a confusing concept. By using a systems approach they might have avoided this and seen the significance of the Hussein-Republican Guard relationship and issued appropriate guidance. By using a common systems-based understanding of center of gravity, planners could identify centers of gravity and decisive points that could be attacked using multi-dimensional systems-shock.

Thus, Desert Storm argues not just the compatibility of systems theory, systems-shock, and a systems-based definition of center of gravity, but for a common use and integration of the three.

SECTION FOUR: EPILOGUE

SUMMARY

The Battle of France showed that a center of gravity does not have to be attacked directly, to be upset. Since, according to systems theory, a center of gravity is linked to a larger system; the linkages can be attacked and severed. If severed, the center of gravity is neutralized. Neutralization was a result of the Germans inducing systems-shock and severing the system's linkages. The Germans, by attacking the physical, moral, and cybernetic domains of the Allies' system, and using the principles of mass, momentum, speed, simultaneity, and depth, (blitzkrieg) shocked the Allies into inaction and eventual surrender. Together systems theory, the modern definition of center of gravity, and systems-shock provide a theoretical explanation of the German success and the rapid Allied collapse. The German success demonstrates the compatibility of the three concepts.

Operation Just Cause showed how a systems theory contributed to understanding the Panamanian system. Systems theory aided planners in the identification of a decisive point, Noreiga, and the center of gravity, the PDF. Based on this identification, military planners were able to focus combat power quickly and simultaneously on both and sever their sustaining linkages. Thus systems theory provided the basis for the identification of centers of gravity and decisive points and enabled planners to apply systems shock to those points resulting in a quick victory. This also demonstrates the compatibility of the three concepts.

Desert Storm argues for a common understanding and integration of the concepts and shows what can happen when planners do not use the concepts together. The air campaign demonstrated what happens when planners use systems theory without the modern concept of center of gravity to focus it. The air campaign attacked a wide variety of strategic targets while

ignoring the Republican Guard, which was probably the key to upsetting the strategic center of gravity; Saddam Hussein. The ground planners used the concept of center of gravity to focus their efforts but failed to use systems theory to identify and understand the linkages and significance of their center of gravity, the Republican Guard. Therefore the Republican Guard escaped and Saddam Hussein's regime survived. As a result of air and ground planners' failure to use the concepts correctly, Desert Storm failed to cause Saddam Hussein to change his behavior and possibly set the stage for a future conflict.

CONCLUSION

The question is, are systems theory, systems-shock and the concept of the center of gravity compatible? The evidence clearly shows that as long as the definition of center of gravity is the modern systems-based definition the answer is yes. The current joint definition of center of gravity uses systems theory as its basis and is therefore compatible with systems theory and systems-shock.

Systems theory and center of gravity proponents should end their pointless debate because it is based on a misunderstanding. As long as center of gravity proponents accept and understand the modern systems-based definition of center of gravity they are in agreement with the systems theorists. As long as both sides ignore the Clausewitzian origin of center of gravity and recognize the systems theory in the modern definition they will be in agreement.

Systems theory, systems-shock, and the center of gravity are not only compatible; they need each other to be of utility. Planners need systems theory, because it explains the complex and adaptive nature of modern societies and militaries. They need it to correctly identify and describe centers of gravity and decisive points. Without systems theory, planners would resort to

the Clausewitzian concept of the center of gravity and attempt to identify the greatest concentration of combat power as the center of gravity. If this concentration existed it would lead to clashes of strength on strength and costly attritional warfare where it might otherwise be avoided.

Clausewitzian concentrations of power rarely exist. Generally, modern militaries and societies do not create such obvious targets. They disperse power across various systems and link or network them so power can be concentrated when needed and then rapidly dispersed for survivability. Systems theory explains this linking and networking process and how these linkages and enabling systems can become centers of gravity or decisive points. Therefore without systems theory planners would be looking for a Clausewitzian center of gravity that rarely exists.

The systems-based concept of centers of gravity and decisive points are the essential tools of campaign design. The systems-based concept of center of gravity maintains its ability to focus military effort on identifiable targets or capabilities, that if neutralized or destroyed removes the enemy's means of resistance. Like a magnifying glass, the center of gravity concept focuses military energy into an intense effort directed at the enemy's centers of gravity or decisive points and prevents dispersion and wasted effort. Thus the center of gravity remains a valid and powerful tool.

Systems theory and systems-shock also need the concept of center of gravity. Without the center of gravity, systems theory would be a descriptive theory with no practical utility. The center of gravity concept gives systems theory a practicable application. The center of gravity and decisive points provide a means to focus systems shock. Without the center of gravity concept to focus systems-shock, military resources could be wasted in a futile effort. The Desert

Storm strategic air campaign is an example of unfocused effort and wasted energy.

IMPLICATIONS

Since the debate is the result of a misunderstanding of the concepts, military graduate schools can provide the solution. These schools should teach the three concepts as a trinity. Systems theory gives us centers of gravity and systems shock. The center of gravity then provides the focus for systems-shock. The schools also need to separate the modern definition of center of gravity from Clausewitz. While Clausewitz deserves credit for originating the concept, instruction should stress the current systems-based definition, not Clausewitz's obsolete linear concept. The best way to do this is to change the name of the concept from center of gravity to *essential systems*. This would create a clean break from Clausewitz's obsolete concept and establish the concept in systems theory. Therefore people looking for understanding of the concept would correctly look to systems theory and not be confused or mislead by Clausewitz's nineteenth century concept.

The schools' curriculum should include systems theory, and teach it as a tool to identify and verify centers of gravity *(essential systems)* and decisive points within a system. Schools would continue to teach these concepts along with, lines of operations and culminating points as the key tools of campaign design. They should include instruction on systems-shock, a subset of systems theory, as a possible method to attack or neutralize centers of gravity *(essential systems)* and decisive points once they are identified. This way, common understanding and unity of effort replace the debate.

APPENDIX

FIGURE 1
Clausewitz's concentrated force center of gravity model

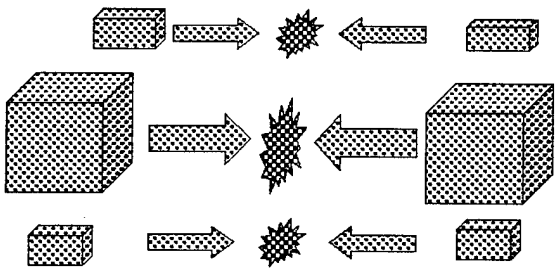
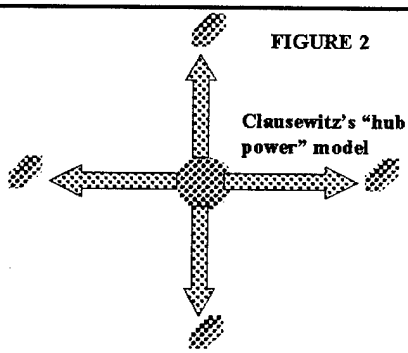
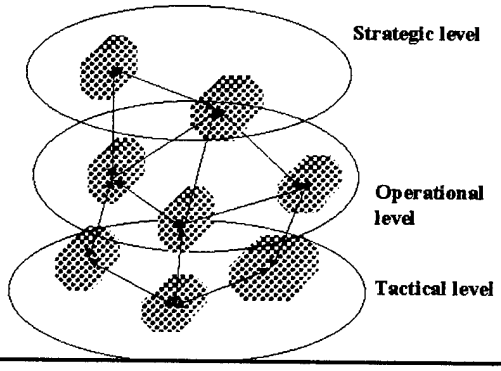


FIGURE 2



Systems model, with multiple interconnected centers of gravity



APPENDIX

FIGURE 3
Systems shock attack against enemy centers of gravity and their enabling connections

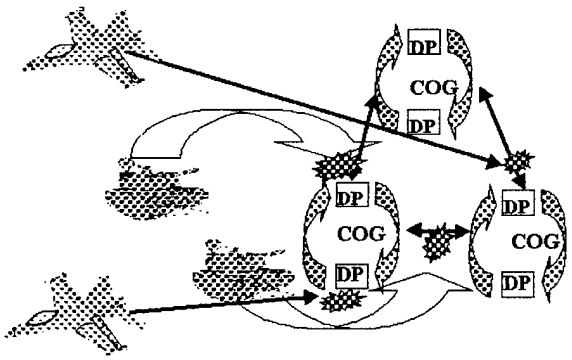
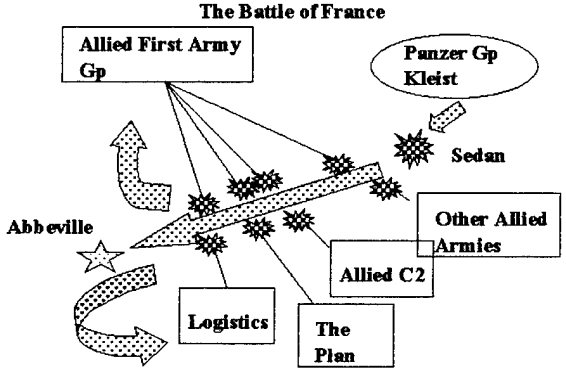


FIGURE 4



The German center of gravity attacking system linkages through a decisive point, not the Allied center of gravity.

APPENDIX

FIGURE 5

Operation Just Cause Center of Gravity and Decisive Point Linkages

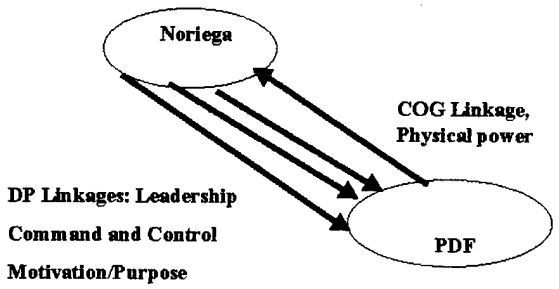
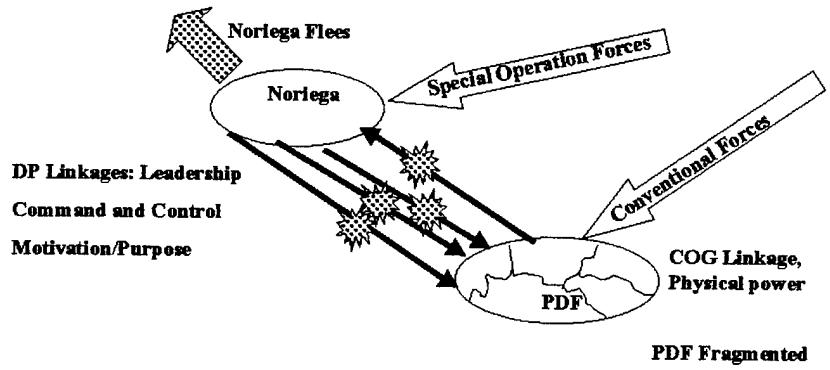


FIGURE 6

Operation Just Cause Severing Center of Gravity and Decisive Point Linkages



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APPENDIX

FIGURE 7

Warden's five ring model at the strategic level

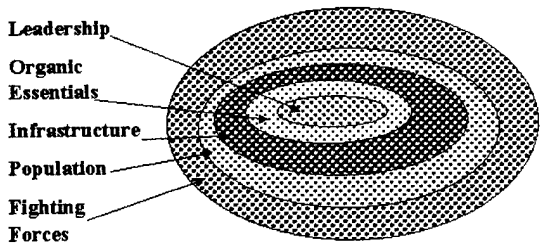
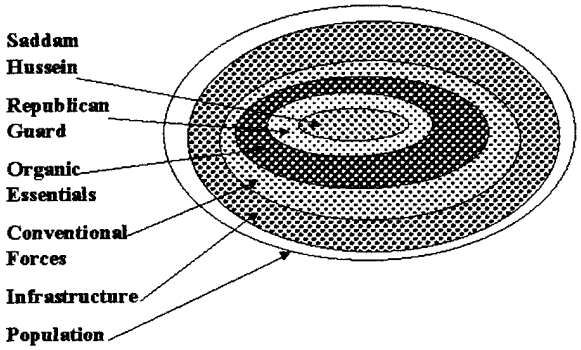


Figure 8

Situational modified ring model at the strategic level



APPENDIX

FIGURE 9

Attacking a decisive point, (the Republican Guard) to upset a Center of Gravity, (Saddam Hussein).

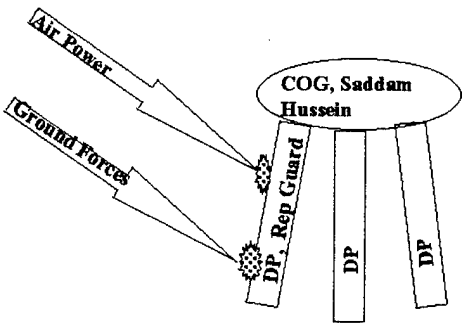
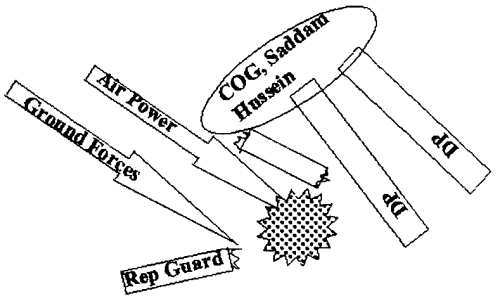


FIGURE 10

Loss of a decisive point, unbalances the Center of Gravity, Saddam Hussein



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[43] Thomas Donnelly, Margaret Roth, and Caleb Baker, p. 100. and Ronald H. Colt, p. 38-41.
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[66] Ibid.
[67] Ibid.
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[71] Ibid.
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